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In re Application of: CHUN-GEUN CHOI

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For:	COLOR CURVE CONTROL CIRCUIT AND METHOD		

PRELIMINARY AMENDMENT

BOX: REISSUE

Assistant Commissioner
for Patents
Washington, D.C. 20231

Sir:

Entry of the following amendments prior to examination and fee calculation of the filing fee for the above-captioned application I respectfully requested.

Folio: P54562RE
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I.D.: REB/SS/sb

CLEAN VERSION OF AMENDMENTS

IN THE SPECIFICATION

1. Please amend the fourth paragraph on column 1, from line 27 through line 34, to read as follows:

CIE defines the three primary colors according to wavelengths, thus light of 700 nm (nanometers) is defined as R, the light of 546 nm is defined as G, and the light of 435 nm is defined as B. CIE uses color matching where mix ratios of the three primary colors are calculated using a color matching measurement device to obtain various colors, thus colors are created by mixing the three colors according to calculated ratios.

2. Please amend the seventh paragraph on column 1, from line 54 through line 64, to read as follows:

For example, when G and B are reduced from the value of a 9300°K (Kelvin) white, the R value becomes relatively large and reddish colors are displayed. The user can utilize different standard white value in the manner that he or she stores different standard white values in memory and selects from them. For this, monitor manufacturers provide several limited colors, or values, which are most frequently utilized by the users. High quality monitors are designed so that the users

can adjust the colors, but inaccurate color values are utilized because they must select them depending on their own eyes.

3. Please amend the first paragraph on column 3, from line 1 through 33, to read as follows:

As shown in FIG. 1, a data input unit 10 includes a temperature sensing unit 11 for generating a temperature signal corresponding to the ambient temperature of the monitor, and a keypad 12 through which users select an automatic mode or manual mode of operation and input color temperature values during the manual mode of operation. A microcomputer 20 receives the ambient temperature generated by temperature sensing unit 11 or the color temperature signals generated by keypad 12, converts the temperature signal into a digital signal, and processes data corresponding to the temperature signals using stored color temperature data and a color curve control program. A digital-to-analog converter (D/A converter) 30 receives digital R, G and B video gain and cutoff signals corresponding to the temperature signals from microcomputer 20, and converts the digital signals into analog signals. An on screen display (OSD) unit 40 processes OSD data which is serially transmitted from microcomputer 20, to display R, G and B OSD signals on the screen for the users. A video pre-amplifying unit 50 amplifies R, G and B video signals generated by a computer graphic adaptor (not shown) according to the levels of the R, G and B gain signals transmitted by D/A converter 30. A multiplexer 60 selects either the R, G and B video signals from video pre-amplifier 50 or the R, G and B OSD signals from OSD unit 40 in response to an enable

signal OSD_EN. A video main-amplifying unit 70 amplifies the R, G and B video signal or the R, G and B OSD signals, transmitted by multiplexer 60, according to the R, G and B cutoff levels generated by D/A converter 30. A cathode-ray tube (CRT) 80 produces beams in response to the amplified R, G and B signals output by video main-amplifying unit 70, through R, G and B cathodes to display the signals.

4. Please amend the second paragraph on column 3, line 34 through line 42, to read as follows:

The operation of the above circuit is now described. The ambient temperature of the monitor is sensed by the temperature sensor of temperature sensing unit 11 in data input unit 10. Since an ambient temperature signal generated by temperature sensing unit 11 is weak, it is amplified by an operational amplifier OP1 and then transmitted to microcomputer 20. The operational amplifier OP1 is connected with the temperature sensing unit 11 to form an amplified temperature sensing signal unit 90. Additionally, color temperature signals, selected by a user using keypad 12 of data input unit 10 during a manual mode, are input to microcomputer 20.

5. Please amend the second complete paragraph on column 4, from line 14 through line 26, to read as follows:

OSD unit 40 receives the OSD data for displaying characters representing the sensed ambient temperature by temperature sensing unit 11 or the color temperature selected by a user through keypad 12. OSD unit 40 also receives horizontal (H-SYNC) and vertical sync (V-SYNC) signals transmitted through a computer graphic adaptor (not shown). The data which is input to OSD unit 40, is generated as signals R_OSD, G_OSD, B_OSD, and OSD_EN in synchronization with the horizontal and vertical sync signals from the graphic adaptor. The signals generated by OSD unit 40 are transmitted to multiplexer 60. This operation of displaying the information and color signals from microcomputer 20 on the screen of the monitor, is described below.

6. Please amend the third complete paragraph on column 4, from line 27 through line 36, to read as follows:

The R, G and B gain signals (R_Gain, G_Gain, B_Gain) generated by microcomputer 20 are converted into analog signals by D/A converter 30. The analog R, G and B gain signals (R_Gain, G_Gain, B_Gain) and R, G and B video signals from the computer graphic adaptor are transmitted to video pre-amplifying unit 50. Red video (R) and red gain (R_Gain) signals are supplied to operational amplifier OP2, green video (G) and green gain (G_Gain) signals are supplied to operational amplifier OP3, and blue video (B) and blue gain (B_Gain) signals are supplied to the operational amplifier OP4.

7. Please amend the fourth complete paragraph on column 4, from line 37 through line 48, to read as follows:

The R, G and B video signals, which are supplied to each operational amplifier of video pre-amplifying unit 50, are amplified to the levels of the red, green and blue gain signals (R_Gain, G_Gain, B_Gain). The R, G and B video signals, amplified by video pre-amplifying unit 50, are transmitted to multiplexer 60. Multiplexer 60 receives signals OSD_ R, OSD_ G, OSD_B, and OSD_EN from OSD unit 40 with the pre-amplified R, G and B video signals. R video signal and signal OSD_R are supplied to operational amplifier OP5, G video signal and signal OSD_G are supplied to operational amplifier OP6, and B video signal and signal OSD_B are supplied to operational amplifier OP7.

8. Please amend the fifth complete paragraph on column 4, from line 49 through line 62, to read as follows:

The R, G and B video signals or the OSD signals, R_OSD, G_OSD, and B_OSD, of operational amplifiers OP5-OP7 are transmitted to video main-amplifying unit 70 in response to signal OSD_EN. At this time, only when multiplexer 60 is turned ON by OSD_EN, are the OSD signals, OSD_R OSD_G, and OSD_B, transmitted from the operational amplifiers of multiplexer

60 to video main-amplifying unit 70. The OSD_EN signal is generated only when the automatic or manual color correction modes are selected by the user using keypad 12, at all other times the R, G and B video signals output from the computer graphic adaptor is displayed according to the current red, green and blue gain (R_Gain, G_Gain, B_Gain) and cutoff (R_Cutoff, G_Cutoff, B_Cutoff) signals applied to amplifiers 50 and 70, respectively.

9. Please amend the paragraph bridging column 4 and 5, from line 63 on column 4 throgh line 12 on column 5, to read as follows:

Video main-amplifying unit 70 receives the R, G and B video or OSD signals selected according to the signal OSD_EN, and red, green and blue cutoff signals (R_Cutoff, G_Cutoff, B_Cutoff) generated by D/A converter 30. R video or R_OSD, and R_Cutoff signals are supplied to operational amplifier OP8, G video or G_OSD, and G_Cutoff signals are supplied to operational amplifier OP9, and B video or B_OSD, and B_Cutoff signals are supplied to operational amplifier OP10 in video main-amplifying unit 70. The R, G and B video or OSD signals, which are transmitted to operational amplifiers OP8-OP10 of video main-amplifying unit 70, are amplified according to the levels of the color cutoff signals (R_Cutoff, G_Cutoff, B_Cutoff), transmitted by D/A converter 30. The amplified signals are sent to corresponding cathodes R (R.K), G (G.K) and B (B.K) for display on the screen of the monitor through CRT (Cathode-ray tube) 80.

10. Please amend the fifth complete paragraph on column 5, from line 38 through line 54, to read as follows:

As shown in FIG. 3, a range of temperatures (T_ len) is established according to T_MIN (minimum temperature) and T_MAX (maximum temperature) in factory mode during manufacture (step S91). When the range of temperatures, T_len, is established, red, green and blue gain and cutoff values corresponding to the respective T_MIN and T_MAX are produced (step S92). The red, green and blue gain and cutoff data corresponding to the range of temperature, T_len, is stored (step S93). A user selects a color correction mode as one of an automatic mode and a manual mode (step S94). The sensed ambient temperature is detected by microprocessor 20 to be compared to the stored values (step S95), when the automatic mode is selected in step S94. A color temperature value is entered by a user to be compared to the stored values (step S96) when the manual mode is selected in step S94. Red, green and blue gain and cutoff values corresponding to the temperature range, T_len, are read (step S97) following steps S95 or S96.

11. Please amend the paragraph bridging column 5 and 6, from line 57 on column 5 through line 19 on column 6, to read as follows:

When establishing the temperature range, T_len, in the factory mode during manufacture, the temperature range is defined with minimum and maximum Kelvin temperatures. When the

minimum and maximum temperatures are established in the factory mode, their coordinates are calculated (step S91). At step S92, red, green and blue gain and cutoff values corresponding to the minimum and maximum temperatures, T_MIN and T_MAX, are calculated. For example, when the minimum temperature T_MIN is set at 5000°K, coordinates corresponding to 5000°K are calculated. When the maximum temperature T_MAX is set at 9300°K, coordinates corresponding to 9300°K are calculated. Red, green and blue gain and cutoff values corresponding to the temperature range between minimum and maximum temperatures T_MIN and T_MAX, is generated using these coordinates. Additionally, a color curve value S, which effects the properties of the curve, is a value fixed during manufacture according to CRT (Cathode-ray tube) properties. When the calculated red, green and blue gain and cutoff data corresponding to the temperature range between minimum and maximum temperatures, T_MIN and T_MAX, are stored at step S93, the operation in a factory mode is completed. When the calculated values are stored at step S93, a temperature is entered according to either a sensed ambient temperature or by the user at steps S95 and S96, respectively, as discussed above following selection of either an automatic or manual mode of color correction in step S94. Then, the red, green and blue gain and cutoff values corresponding to the temperature range, T_len, are read (step S97) following steps S95 or S96.

12. Please amend the first complete paragraph on column 6, from line 20 through line 27, to read as follows:

Coordinates *xc* corresponding to the input temperature are calculated (step S98) from the following formula using the color curve value S:

$$xc=T-(x-T\_len)\cdot(x+T\_len)\times S$$

where, T is a predetermined temperature, *x* is a temperature which is substituted for medium temperature, T_len is a range of temperature, and S is the slope of the temperature curve.

13. Please amend the second complete paragraph on column 6, from line 28 through line 59, to read as follows:

When the coordinates of *xc* corresponding to the predetermined temperature are obtained, color temperature data Rx, Gx, and Bx, corresponding to the predetermined temperature are calculated. The data is obtained using the following formulas:

$$Rx=(Rmin\times(T\_MAX-xc)+Rmax\times(xc-T\_MIN))/(T\_MAX-T\_MIN)$$

$$Gx=(Gmin\times(T\_MAX-xc)+Gmax\times(xc-T\_MIN))/(T\_MAX-T\_MIN)$$

Bx=(Bmin×(T_MAX-xc)+Bmax×(xc-T_MIN))/(T_MAX-T_MIN)

where, the calculated color temperature data, Rx, Gx, and Bx, are digital signals. The color temperature data (Rx, Gx, and Bx) is converted onto red, green and blue gain and cutoff data. That is, video signal gains and cutoff values (R_Gain, G_Gain, B_Gain R_Cutoff, G_Cutoff and B_Cutoff) are calculated from the values, T_MIN and T_MAX, according to the temperature which is input to microprocessor 20 in steps S95 or S96. The gain and cutoff values are obtained (step 99) using the following formulas:

R-Gain=(Rmin×(T_MAX-xc)+Rmax×(xc-T_MIN))/(T_MAX-T_MIN)

G-Gain=(Gmin×(T_MAX-xc)+Gmax×(xc-T_MIN))/(T_MAX-T_MIN)

B-Gain=(Bmin×(T_MAX-xc)+Bmax×(xc-T_MIN)/(T_MAX-T_MIN)

R_Cutoff=(Rmin×(T_MAX-*xc*)+Rmax×(*xc*-T_MIN)/(T_MAX-T_MIN)

G_Cutoff=(Gmin×(T_MAX-*xc*)+Gmax×(*xc*-T_MIN)/(T_MAX-T_MIN)

B_Cutoff=(Bmin×(T_MAX-*xc*)+Bmax×(*xc*-T_MIN)/(T_MAX-T_MIN)

14. Please amend the second paragraph on column 7, from line 10 through line 15, to read as follows:

Consequently, the present invention adjusts colors displayed on a monitor using red, green and blue gain and cut-off signals which change according to a color curve in a color space in order to adjust colors as a user wants, thereby improving the color function which enables the user to easily adjust colors in the state he or she wants.

IN THE CLAIMS

Please add the new claims 9 through 73, as follows:

9. A method of color display adjustment, comprising:

selecting a range of temperatures according to maximum and minimum color temperature values;

inputting a user selected value; and

determining color gain and cut-off data according to said user selected value, said maximum color temperature and said minimum color temperature.

10. The method of claim 9, further comprising of converting said color gain and cut-off values to analog signals.

11. The method of color display adjustment of claim 9, further comprising of determining initial color gain and cutoff values corresponding to the color temperature range between maximum and minimum color temperature values before said inputting said user selected value.

12. A method of color display adjustment, comprising:

selecting a range of temperatures according to maximum and minimum color temperature values;

inputting a user selected value within said range; and

determining color gain and cut-off data according to said user selected value, said maximum color temperature and said minimum color temperature.

13. A method of color display adjustment, comprising:

receiving a user selected value;

establishing a range of color temperatures; and

calculating gain and cutoff values according to said range and user selected value.

14. The method of claim 13, further comprising of converting said color gain and cut-off values to analog signals.

15. A method of color display adjustment, comprising:

setting a range of color temperature values;

determining color gain and cutoff data corresponding to minimum and maximum color temperature values in said range of color temperature values;

storing said color gain and cutoff data;

entering a color temperature value by a user;

reading said color gain and cut-off values corresponding to said range; and

calculating color gain and cut-off values according to said entered color temperature value.

16. A method of obtaining color temperature data for a color curve control circuit, comprising:

providing a range of temperatures between a maximum and a minimum temperature;

providing a gain and cutoff data according to said minimum temperature;

providing a slope of a temperature curve; and

calculating color temperature data corresponding to a selected temperature according to said slope of said temperature curve.

17. The method of claim 16, with the slope of said temperature curve being a predetermined value set during manufacture according to properties of a video display.

18. The method of claim 16, with said color temperature data being red temperature data, green temperature data, and blue temperature data.

19. The method of claim 16, with said gain being a red gain, a green gain and a blue gain.

20. The method of claim 16, with said cutoff being a red cutoff, a green cutoff, and a blue cutoff.

21. The method of claim 16, further comprising of converting said color temperature data into an analog signal.

22. The method of claim 16, further comprising formulas for calculating said color temperature data being:

$R_x=(R_{min} \times (T\_MAX-xc) + R_{max} \times (xc-T\_MIN))/(T\_MAX-T\_MIN)$;

$G_x=(G_{min} \times (T\_MAX-xc) + G_{max} \times (xc-T\_MIN))/(T\_MAX-T\_MIN)$; and

$B_x=(B_{min} \times (T\_MAX-xc) + B_{max} \times (xc-T\_MIN))/(T\_MAX-T\_MIN)$;

wherein R_x, G_x, B_x corresponds to the color temperature of a red, green, and blue color signals respectively, R_{min}, G_{min}, B_{min} corresponding to a minimum value of the color temperature of the red, green, and blue color signals respectively, R_{max}, G_{max}, B_{max} corresponding to a maximum value of the color temperature of the red, green, and blue color signals respectively, T_MAX corresponding to the maximum temperature in the range of temperature, and T_MIN corresponding to the minimum temperature in the range of temperature.

23. A method of adjusting color on a monitor, comprising:

providing a slope of a temperature curve representing the gain of each color at a selected temperature;

providing both a temperature sensor detecting a temperature and a manual switch manually selecting a temperature;

inputting a temperature in accordance with one of the temperature sensor and said manual switch; and

calculating said gain of each color in response to said temperature.

24. A method, comprising:

entering values to change the colors on the screen of a video monitor;

processing color signals corresponding to color temperature using stored color temperature values and a color curve control program in order to change the colors on the screen according to signals received by the entering values, and generating digital color gain signals and digital color cutoff signals; and

converting the digital color gain signals and the digital cutoff signals from the processing color signals into analog gain signals and analog cutoff signals.

25. The method of claim 24, further comprising:

generating on-screen display signals describing a procedure of transmitting the display values from entering values to processing the values, and changing the colors on the screen using said display values; and

supplying selectively the on-screen display signals for display.

26. The method of claim 24, with the entering values further comprising:

automatically sensing ambient temperature of the video monitor, and generating a temperature signal automatically changing a color of the screen according to the temperature of the video monitor; and

entering manually temperature values indicating a desired color to change the color of the screen.

27. The method of claim 24, further comprising:

generating amplified red, green and blue video color signals by receiving red, green and blue video color signals from a computer and amplifying said red, green and blue video color signals in response to said analog gain signals;

generating red, green and blue on-screen display signals describing a procedure of transmitting the display values from the entering the values to the processing the color signals, and changing the colors on the screen using said display values;

supplying selectively the amplified red, green and blue video signals and the red, green and blue on-screen display signals transmitted by the generating red, green and blue on-screen display signals; and

amplifying, in response to said analog cutoff signals, one of the amplified red, green and blue video signals and the red, green and blue on-screen display signals selectively supplied.

28. A method, comprising:

entering temperature information;

generating digital red, green and blue video gain signals and digital red, green and blue video cutoff signals by converting the temperature information into a digital signal, and processing color signals corresponding to the temperature information using stored color temperature data and a color curve control program;

converting the digital red, green and blue video gain signals and the digital red, green and blue video cutoff signals from a microcomputer into analog red, green and blue video gain signals and analog red, green and blue video cutoff signals;

generating amplified red, green and blue video signals by receiving red, green and blue video color signals from a computer and amplifying said red, green and blue video color signals in response to said analog red, green and blue video gain signals; and

generating amplified red, green and blue video display signals, for display on a color monitor, by receiving the amplified red, green and blue video signals generated by the generating amplified red, green and blue video signals and amplifying the amplified red, green and blue video signals in response to said analog red, green and blue video cutoff signals.

29. The method of claim 28, further comprising:

generating red, green and blue on-screen display signals describing a procedure for inputting said temperature information; and

supplying selectively the amplified red, green and blue video signals generated by said

generating amplified red, green and blue video signals and the red, green and blue on-screen display signals transmitted to said generating amplified red, green and blue video display signals.

30. The method of claim 28, with the entering temperature information further comprising of selecting a manual mode for manually inputting the temperature information.

31. The method of claim 30, further comprising:

generating red, green and blue on-screen display signals describing a procedure for inputting said temperature information during said manual mode; and

selectively supplying the amplified red, green and blue video signals generated by said generating amplified red, green and blue video signals by receiving red, green and blue video color signals from a computer and the red, green and blue on-screen display signals transmitted by the generating red, green and blue on-screen display signals to said generating amplified red, green, and blue video display signals, for display on a color monitor.

32. A method, comprising:

setting a temperature range;

determining the gains and cutoff values of a plurality of color data signals, each one of the color data signals being a distinct spectral component, said plurality of color data signals forming a color video image when combined, the plurality of color data signals including a first color data

signal, a second data signal, and a third data signal corresponding to a minimum temperature value and maximum temperature value in said set temperature range;

entering a temperature; and

reading gains and cutoff values of the first, second, and third color data signal corresponding to said temperature range.

33. The method of claim 32, further comprising of determining *xc* corresponding to the input temperature from the following formula with color curve slope of value S:

$xc=T-(x-T\_len) \times (x+T\_len) \times S;$

with T corresponding to a predetermined temperature, *x* corresponding to a temperature substituted for a medium temperature, T_len corresponding to the range of temperatures, and S corresponding to the slope of the temperature curve.

34. The method of claim 33, further comprising of determining color temperature data for each one of the first, second, and third color data signals according to the following formula:

$A_x=(A_{min} \times (T\_MAX-xc) + A_{max} \times (xc-T\_MIN))/(T\_MAX-T\_MIN);$

wherein A_x corresponds to the color temperature of one of the color data signals, A_{min} corresponds to a minimum value of the color temperature of one of the color data signals, A_{max} corresponding the a maximum value of the color temperature of one of the color data signals, T_MAX corresponding to the maximum temperature in the range of temperature, T_MIN

corresponding to the minimum temperature in the range of temperature.

35. The method of claim 34, further comprising of determining gain and cutoff values of each one of the video components according to A_x with respect to the inputted temperature.

36. The method of claim 35, further comprising of converting the gain and cutoff values from digital to analog.

37. The method of claim 36, further comprising of determining whether the color displayed on the screen is the desired color according to the gain and cutoff values.

38. The method of claim 37, with the first color data signal being a red video signal, the second color data signal being a blue video signal, and the third color data signal being a green video signal.

39. A color curve control circuit, comprising:

a data input unit selectively entering values to change the colors on the screen of a video monitor; and

a microcomputer processing color signals corresponding to color temperatures including a color curve control program generating digital color gain signals and digital color cutoff signals

using a selected range of color temperatures according to signals received by said data input unit.

40. The color curve control circuit of claim 39, further comprising a digital to analog converter for converting the digital color gain signals and the digital cutoff signals from the microcomputer into analog gain signals and analog cutoff signals.

41. The circuit according to claim 39, further comprising an on-screen display unit, for generating on-screen display signals describing a procedure of transmitting the display values from the data input unit to the microcomputer, and changing the colors on the screen using said display values.

42. The circuit according to claim 41, further comprising a multiplexer for selectively supplying the on-screen display signals transmitted by the on-screen display unit.

43. The circuit according to claim 39, further comprising an on-screen display unit generating red, green, and blue on-screen display signals to display on the screen from data transmitted from the microcomputer.

44. The circuit according to claim 43, further comprising a multiplexer selecting either the red, green, and blue video signals from a video pre-amplifier or the red, green and blue on-screen

display signals from the on-screen display unit in response to an enable signal from the on-screen display unit.

45. The circuit according to claim 39, with the microcomputer generating on-screen display values for an on-screen display unit, the on-screen display values including information on the color temperature signal selected by a user for transmission to the on-screen display unit to be displayed and viewed by the user.

46. The circuit according to claim 39, further comprising an on-screen display unit displaying the color temperature selected by a user through said data input unit, the on-screen display unit receiving horizontal and vertical sync signals, from the data inputted from the microprocessor to the on-screen display unit, the on-screen display unit outputting on-screen display signals for each of the color signals, and an on-screen display enable signal in synchronization with the horizontal and vertical sync signal.

47. The circuit according to claim 46, with the on-screen display enable signal being generated only when a color correction mode is selected by a user using a data input unit.

48. The circuit according to claim 46, with the color signals being displayed according to a current gain and cutoff signals when there is no on-screen display enable signal.

49. The circuit according to claim 39, further comprising a plurality of first amplifier units for each color component of the color signals, the color signals being amplified to the levels of the gain signals in each color component of the color signals from the digital to analog converter.

50. An apparatus, comprising:

a data input unit selectively entering values manually or automatically to change the colors on the screen of a video monitor;

a microcomputer processing a plurality of color data signals by using color temperature data corresponding to the plurality of color data signals, the color temperature data computed by said microcomputer according to a selected range of color temperatures and the signals received from the data input unit; and

a digital to analog converter for converting the digital color gain signals and the digital cutoff signals from the microcomputer into analog gain signals and analog cutoff signals.

51. The apparatus of claim 50, further comprising:

a first amplifier for amplifying the plurality of color data signals according to the respective gain signals for each on the color data signals;

an on-screen display unit generating an on-screen display signal for each one of the plurality of color data signals and an on-screen display enable signal;

a multiplexer selectively supplying the amplified color data signals from the first amplifier and the plurality of on-screen display signals from the on-screen display unit; and

a second amplifier for amplifying the plurality of color data signals amplified by the first amplifier or the plurality of on-screen display signals, transmitted by the multiplexer, according to the cut off levels for each of the plurality of color data signals generated by the digital to analog converter.

52. The apparatus of claim 50, further comprising an on-screen display unit generating an on-screen display signal for each one of the plurality of color data signals and an on-screen display enable signal.

53. The apparatus of claim 51, with the on-screen display signals for each one of the plurality of color data signals being transmitted to the second amplifier in response to the on-screen display enable signal.

54. The apparatus of claim 50, further comprising an on-screen display unit generating an on-screen display signal including information on the color temperature signal selected by the user.

55. The apparatus of claim 51, with the multiplexer being turned on by the on-screen

display enable signal to transmit the on-screen display signals from amplifiers of the multiplexer to the second amplifying unit.

56. The apparatus of claim 55, with the on-screen display enable signal being generated when the data input unit selectively enters values to change the colors on the screen of the video monitor.

57. The apparatus of claim 51, with the multiplexer further comprising a plurality of operational amplifiers, each one of the plurality of operational amplifiers corresponding to an on-screen display signal for a corresponding one of the color data signals.

58. The apparatus of claim 51, with the second amplifier amplifying the plurality of color data signals or the on-screen display signals according to the levels of the color cutoff signals for each of the color data signals transmitted by the digital to analog converter.

59. The apparatus of claim 50, with the microcomputer including a color curve program adjusting the color using a color curve with the range of temperatures established according to a preset maximum temperature and minimum temperature.

60. The apparatus of claim 50, with the microcomputer computing the color temperature

data by using a maximum and minimum temperatures of the selected range of color temperatures.

61. A method of displaying color adjustment in a display monitor stored in a microcomputer, comprising:

receiving a user selected color temperature value;

determining a color temperature data according to a user selected color temperature value, a corresponding color curve and a predetermined range of color temperature values; and

determining color gain and cut-off values corresponding to said user selected color temperature value according to said color temperature data.

62. The method of claim 61, further comprising of converting said color gain and cut-off values to analog signals.

63. A computer storage medium having stored thereon a set of instructions implementing a method of displaying color adjustment in a display monitor having an associated color curve and a predetermined range of color temperatures with a maximum value and a minimum value, said set of instructions comprising one or more instructions for:

receiving a user selected color temperature value;

determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range;

determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data; and

converting said color gain and cutoff values to analog signals.

64. An apparatus, comprising a microcomputer including a memory for storing instructions for displaying and adjusting color in a display monitor with an associated color curve, a predetermined range of color temperatures with a maximum value and minimum value, the instructions comprising of receiving a user selected color temperature value, determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range, determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data.

65. A set of instructions implementing a method of displaying color adjustment in a display monitor having an associated color curve and a predetermined range of color temperatures with a maximum value and a minimum value stored, said method comprising:

receiving a user selected color temperature value;

determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range stored in said microcomputer;

determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data stored in said microcomputer; and

converting said color gain and cutoff values to analog signals.

66. An apparatus, comprising a microcomputer storing instructions for displaying and adjusting color in a display monitor with an associated color curve, a predetermined range of color temperatures with a maximum value and minimum value, the instructions comprising of receiving a user selected color temperature value, determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range, determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data.

67. An apparatus, comprising of a unit storing instructions for displaying and adjusting color in a display monitor with an associated color curve, a predetermined range of color temperatures with a maximum value and minimum value, the instructions comprising of receiving a user selected color temperature value, determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range, determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data.

68. A stored program providing a method of displaying color adjustment in a display monitor having an associated color curve and a predetermined range of color temperatures with a

maximum value and a minimum value, said method comprising:

receiving a user selected color temperature value;

determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range;

determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data; and

converting said color gain and cutoff values to analog signals.

69. A method, comprising:

receiving a user selected color temperature value;

determining a color temperature data based on said user selected color temperature value, said associated color curve and said predetermined range;

determining color gain and cut-off values corresponding to said user selected color temperature value based on said color temperature data; and

converting said color gain and cutoff values to analog signals.

70. The method of claim 69, with said steps being implemented by a stored program.

71. The method of claim 70, with said program being stored in a memory.

72. The method of claim 70, with said program being stored in a memory of a microcomputer.

73. The method of claim 70, with said program being stored in a storage medium comprised from a microcomputer.

REMARKS

Claims 1 through 73 are pending in this reissue application.

The specification is being amended and Claims 9 through 73 are being newly added.

The amended specification has no new matter and is supported by all of the drawings and the specification of the present patent.

Drawing corrections have been made to Figures 1 through 3. Accordingly, a Request for Approval of Drawing Changes accompanies this response. Indication in subsequent Office correspondence of the acceptance to the drawing corrections proposed in the Request, is requested to enable applicant to timely arrange for the corrections to be made prior to the date for payment of any issue fee. No new matter was added. The approval of the drawing corrections are respectfully requested.

With regards to 37CFR§1.173(c), the following includes an explanation of the support in the disclosure of the patent for the additional claims. The added claims 9 through 73 are supported as a whole by Figures 1 through 3 and the entire specification of the present patent. Specifically, for example, added claims 9-14, and 15 are sets of method claims supported by for example by column 5, line 39 to column 7, line 21 with respect to figure 3. Added claims 16-22, and 23 are also for example supported by col. 5, line 39 to col. 7, line 21 with respect to figure 3. Added claims 24-27,

28-31, 32-38 are sets of method claims supported by disclosure relating to figure 3 for example. Added claims 39-49, 50-60 are apparatus claims that are for example supported by figures 1, 2 and the corresponding disclosure in the specification. Added claims 61-62, 63, 65, 68, 69-73 are method claims that are for example supported by the disclosure relating to figure 3. Added claims 64, 66, and 67 are apparatus claims that are supported for example by the disclosure relating to figure 1 and 2.

In view of the foregoing Preliminary Amendment, this reissue application is believed to be in condition for examination. Should questions arise during examination, the Examiner is requested to contact applicant's attorney.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

1. Please amend the fourth paragraph on column 1, from line 27 through line 34, as follows:

CIE defines the three primary colors according to wavelengths, thus light of 700 nm (nanometers) is defined as R, the light of 546 nm is defined as G, and the light of 435 nm is defined as B. CIE uses color matching where mix ratios of the three primary colors are calculated using a color matching measurement device to obtain various colors, thus colors are created by mixing the three colors according to calculated ratios.

2. Please amend the seventh paragraph on column 1, from line 54 through line 64, as follows:

For example, when G and B are reduced from the value of a 9300°K (Kelvin) white, the R value becomes relatively large and reddish colors are displayed. The user can utilize different standard white value in the manner that [he/she] he or she stores different standard white values in memory and selects from them. For this, monitor manufacturers provide several limited colors, or values, which are most frequently utilized by the users. High quality monitors are designed so that the users can adjust the colors, but inaccurate color values are utilized because they must select them

depending on their own eyes.

3. Please amend the first paragraph on column 3, from line 1 through 33, as follows:

As shown in FIG. 1, a data input unit 10 includes a temperature sensing unit 11 for generating a temperature signal corresponding to the ambient temperature of the monitor, and a keypad 12 through which users [selects] select an automatic mode or manual mode of operation and [inputs] input color temperature values during the manual mode of operation. A microcomputer 20 receives the ambient temperature generated by temperature sensing unit 11 or the color temperature signals generated by keypad 12, converts the temperature signal into a digital signal, and processes data corresponding to the temperature signals using stored color temperature data and a color curve control program. A digital-to-analog converter (D/A converter) 30 receives digital R, G and B video gain and cutoff signals corresponding to the temperature signals from microcomputer 20, and converts the digital signals into analog signals. An on screen display (OSD) unit 40 processes OSD data which is serially transmitted from microcomputer 20, to display R, G and B OSD signals on the screen for the users. A video pre-amplifying unit 50 amplifies R, G and B video signals generated by a computer graphic adaptor (not shown) according to the levels of the R, G and B gain signals transmitted by D/A converter 30. A multiplexer 60 selects either the R, G and B video signals from video pre-amplifier 50 or the R, G and B OSD signals from OSD unit 40 in response to an enable signal OSD_EN. A video main-amplifying unit 70 amplifies the R, G and B video signal or the R,

G and B OSD signals, transmitted by multiplexer 60, according to the R, G and B cutoff levels generated by D/A converter 30. A cathode-ray tube (CRT) 80 produces beams in response to the amplified R, G and B signals output by video main-amplifying unit 70, through R, G and B cathodes to display the signals.

4. Please amend the second paragraph on column 3, line 34 through line 42, as follows:

The operation of the above circuit is now described. The ambient temperature of the monitor is sensed by the temperature sensor of temperature sensing unit 11 in data input unit 10. Since an ambient temperature signal generated by temperature sensing unit 11 is weak, it is amplified by an operational amplifier OP1 and then transmitted to microcomputer 20. The operational amplifier OP1 is connected with the temperature sensing unit 11 to form an amplified temperature sensing signal unit 90. Additionally, color temperature signals, selected by a user using keypad 12 of data input unit 10 during a manual mode, are input to microcomputer 20.

5. Please amend the second complete paragraph on column 4, from line 14 through line 26, as follows:

OSD unit 40 receives the OSD data for displaying characters representing the sensed ambient temperature by temperature sensing unit 11 or the color temperature selected by a user through

keypad 12. OSD unit 40 also receives horizontal (H-SYNC) and vertical sync (V-SYNC) signals transmitted through a computer graphic adaptor (not shown). The data which is input to OSD unit 40, is generated as signals R_OSD, G_OSD, B_OSD, and OSD_EN in synchronization with the horizontal and vertical sync signals from the graphic adaptor. The signals generated by OSD unit 40 are transmitted to multiplexer 60. This operation of displaying the information and color signals from microcomputer 20 on the screen of the monitor, is described below.

6. Please amend the third complete paragraph on column 4, from line 27 through line 36, as follows:

The R, G and B gain signals (R_Gain, G_Gain, B_Gain) generated by microcomputer 20 are converted into analog signals by D/A converter 30. The analog R, G and B gain signals (R_Gain, G_Gain, B_Gain) and R, G and B video signals from the computer graphic adaptor are transmitted to video pre-amplifying unit 50. [R] Red video (R) and [R] red gain (R_Gain) signals are supplied to operational amplifier OP2, [G] green video (G) and [G] green gain (G_Gain) signals are supplied to operational amplifier OP3, and [B] blue video (B) and [B] blue gain (B_Gain) signals are supplied to the operational amplifier OP4.

7. Please amend the fourth complete paragraph on column 4, from line 37 through line 48, as follows:

The R, G and B video signals, which are supplied to each operational amplifier of video pre-amplifying unit 50, are amplified to the levels of the [R] red, [G] green and [B] blue gain signals (R_Gain, G_Gain, B_Gain). The R, G and B video signals, amplified by video pre-amplifying unit 50, are transmitted to multiplexer 60. Multiplexer 60 receives signals OSD_ R, OSD_ G, OSD_B, and OSD_EN from OSD unit 40 with the pre-amplified R, G and B video signals. R video signal and signal OSD_R are supplied to operational amplifier OP5, G video signal and signal OSD_G are supplied to operational amplifier OP6, and B video signal and signal OSD_B are supplied to operational amplifier OP7.

8. Please amend the fifth complete paragraph on column 4, from line 49 through line 62, as follows:

The R, G and B video signals or the OSD signals, R_OSD, G_OSD, and B_OSD, of operational amplifiers OP5-OP7 are transmitted to video main-amplifying unit 70 in response to signal OSD_EN. At this time, only when multiplexer 60 is turned ON by OSD_EN, are the OSD signals, OSD_R OSD_G, and OSD_B, transmitted from the operational amplifiers of multiplexer 60 to video main-amplifying unit 70. The OSD_EN signal is generated only when the automatic or manual color correction modes are selected by the user using keypad 12, at all other times the R, G and B video signals output from the computer graphic adaptor is displayed according to the current

[R] red, [G] green and [B] blue gain (R_Gain, G_Gain, B_Gain) and cutoff (R_Cutoff, G_Cutoff, B_Cutoff) signals applied to amplifiers 50 and 70, respectively.

9. Please amend the paragraph bridging column 4 and 5, from line 63 on column 4 throgh line 12 on column 5, as follows:

Video main-amplifying unit 70 receives the R, G and B video or OSD signals selected according to the signal OSD_EN, and [R] red, [G] green and [B] blue cutoff signals (R_Cutoff, G_Cutoff, B_Cutoff) generated by D/A converter 30. R video or R_OSD, and R_Cutoff signals are supplied to operational amplifier OP8, G video or G_OSD, and G_Cutoff signals are supplied to operational amplifier OP9, and B video or B_OSD, and B_Cutoff signals are supplied to operational amplifier OP10 in video main-amplifying unit 70. The R, G and B video or OSD signals, which are transmitted to operational amplifiers OP8-OP10 of video main-amplifying unit 70, are amplified according to the levels of the color cutoff signals (R_Cutoff, G_Cutoff, B_Cutoff), transmitted by D/A converter 30. The amplified signals are sent to corresponding cathodes R (R.K), G (G.K) and B (B.K) for display on the screen of the monitor through CRT (Cathode-ray tube) 80.

10. Please amend the fifth complete paragraph on column 5, from line 38 through line 54, as follows:

As shown in FIG. 3, a range of temperatures (T_ len) is established according to T_MIN (minimum temperature) and T_MAX (maximum temperature) in factory mode during manufacture (step S91). When the range of temperatures, T_len, is established, [R] red, [G] green and [B] blue gain and cutoff values corresponding to the respective T_MIN and T_MAX are produced (step S92). The [R] red, [G] green and [B] blue gain and cutoff data corresponding to the range of temperature, T_len, is stored (step S93). A user selects a color correction mode as one of an automatic mode and a manual mode (step S94). The sensed ambient temperature is detected by microprocessor 20 to be compared to the stored values (step S95), when the automatic mode is selected in step S94. A color temperature value is entered by a user to be compared to the stored values (step S96) when the manual mode is selected in step S94. [R] Red, [G] green and [B] blue gain and cutoff values corresponding to the temperature range, T_len, are read (step S97) following steps S95 or S96.

11. Please amend the paragraph bridging column 5 and 6, from line 57 on column 5 through line 19 on column 6, as follows:

When establishing the temperature range, T_len, in the factory mode during manufacture, the temperature range is defined with minimum and maximum Kelvin temperatures. When the minimum and maximum temperatures are established in the factory mode, their coordinates are calculated (step S91). At step S92, [R] red, [G] green and [B] blue gain and cutoff values corresponding to the minimum and maximum temperatures, T_MIN and T_MAX, are calculated.

For example, when the minimum temperature T_MIN is set at 5000°K, coordinates corresponding to 5000°K are calculated. When the maximum temperature T_MAX is set at 9300°K, coordinates corresponding to 9300°K are calculated. [R] Red, [G] green and [B] blue gain and cutoff values corresponding to the temperature range between minimum and maximum temperatures T_MIN and T_MAX, is generated using these coordinates. Additionally, a color curve value S, which effects the properties of the curve, is a value fixed during manufacture according to CRT (Cathode-ray tube) properties. When the calculated [R] red, [G] green and [B] blue gain and cutoff data corresponding to the temperature range between minimum and maximum temperatures, T_MIN and T_MAX, are stored at step S93, the operation in a factory mode is completed. When the calculated values are stored at step S93, a temperature is entered according to either a sensed ambient temperature or by the user at steps S95 and S96, respectively, as discussed above following selection of either an automatic or manual mode of color correction in step S94. Then, the [R] red, [G] green and [B] blue gain and cutoff values corresponding to the temperature range, T_len, are read (step S97) following steps S95 or S96.

12. Please amend the first complete paragraph on column 6, from line 20 through line 27, as follows:

Coordinates [xc] *xc* corresponding to the input temperature are calculated (step S98) from the following formula using the color curve value S:

xc=T-(x-T_len)·(x+T_len)×S

[wherein] where, T is a predetermined temperature, [x] x is a temperature which is substituted for medium temperature, T_len is a range of temperature, and S is the slope of the temperature curve.

13. Please amend the second complete paragraph on column 6, from line 28 through line 59, as follows:

When the coordinates of [xc] xc corresponding to the predetermined temperature are obtained, color temperature data Rx, Gx, and Bx, corresponding to the predetermined temperature are calculated. The data is obtained using the following formulas:

Rx=(Rmin×(T_MAX-xc)+Rmax×(xc-T_MIN))/(T_MAX-T_
MIN)

Gx=(Gmin×(T_MAX-xc)+Gmax×(xc-T_MIN))/(T_MAX-T_
MIN)

Bx=(Bmin×(T_MAX-xc)+Bmax×(xc-T_MIN))/(T_MAX-T_
MIN)

[wherein] where, the calculated color temperature data, Rx, Gx, and Bx, are digital signals. The color temperature data (Rx, Gx, and Bx) is converted onto [R] red, [G] green and [B] blue gain and cutoff data. That is, video signal gains and cutoff values (R_Gain, G_Gain, B_Gain R_Cutoff, G_Cutoff and B_Cutoff) are calculated from the values, T_MIN and T_MAX, according to the temperature which is input to microprocessor 20 in steps S95 or S96. The gain and cutoff values are obtained (step 99) using the following formulas:

R-Gain=(Rmin×(T_MAX-*xc*)+Rmax×(*xc*-T_MIN))/(T_MAX-T_MIN)

G-Gain=(Gmin×(T_MAX-*xc*)+Gmax×(*xc*-T_MIN))/(T_MAX-T_MIN)

B-Gain=(Bmin×(T_MAX-*xc*)+Bmax×(*xc*-T_MIN)/(T_MAX-T_MIN)

R_Cutoff=(Rmin×(T_MAX-*xc*)+Rmax×(*xc*-T_MIN)/(T_MAX-T_MIN)

G_Cutoff=(Gmin×(T_MAX-*xc*)+Gmax×(*xc*-T_MIN)/(T_

MAX-T_MIN)

B_Cutoff=(Bmin×(T_MAX-*xc*)+Bmax×(*xc*-T_MIN)/(T_MAX-

T_MIN)

14. Please amend the second paragraph on column 7, from line 10 through line 15, as follows:

Consequently, the present invention adjusts colors displayed on a monitor using [R] red, [G] green and [B] blue gain and cut-off signals which change according to a color curve in a color space in order to adjust colors as a user wants, thereby improving the color function which enables the user to easily adjust colors in the state [he/she] he or she wants.

IN THE CLAIMS

Please add the new claims 9 through 73, as listed above.